

DETAILED ACTION

1. Applicant's election without traverse of Group I and Species B in the reply filed on 17 August 2009 is acknowledged.
2. Claims 9 and 12-19 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention or species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 17 August 2009. Claims 1-8, 10, and 11 will be examined on the merits.

Claim Rejections - 35 USC § 102 / 35 USC § 103

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claims 1, 3, and 8 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over U.S. Patent Application Publication 2002/0045146 to Wang et al.**

In regards to Claim 1, Wang et al. teaches a thermal processing apparatus comprising: a processing container 2 for containing an object to be processed (a plurality of wafers W), a plurality of heaters 31-35 for heating the object to be

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processed, a plurality of temperature sensors Sin1-Sin5 for respectively detecting temperatures at a plurality of predetermined positions in the processing container, a storing part that stores: a thermal model for forecasting a temperature of the object W to be processed contained in the container from outputs of the plurality of temperature sensors, and a recipe in which a desired temperature of the object to be processed is defined, and a controlling part that forecasts a temperature of the object to be processed by using the outputs of the plurality of temperature sensors and the thermal model, and that controls the plurality of heaters 31-35 so as to cause the forecasted temperature of the object to coincide with the desired temperature defined in the recipe, wherein the thermal model is configured to additionally forecast a temperature of at least one other predetermined portion in the processing container (the temperature of the temperature sensors Sin1 to Sin5 arranged on an inner pipe 2a of a processing container), a desired temperature of the predetermined portion is also defined in the recipe, and the controlling part is adapted to forecast a temperature of the object and a temperature of the predetermined portion by using outputs of the plurality of temperature sensors and the thermal model, and to control the plurality of heaters so as to cause the forecasted temperature of the object to coincide with the respective desired temperature. (See at least Figure 2; Abstract; Paragraphs 37-49 and 63-76)

Wang et al. appears to further teach that the controlling part is further adapted to control the plurality of heaters so as to cause the forecasted temperature of the predetermined portion to coincide with the respective desired temperature. See for example Paragraph 49, which discloses that the “model M is a heater control model

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(mathematical model: higher degree multidimensional function) designed to *estimate temperatures of wafers W* mounted on the wafer boat 23 in the respective zones, *and temperatures of the thermocouples Sin1-Sin5*, based on output signals (metered temperatures) of the thermocouples Sin1-Sin5 and Sout1-Sout5 and fed electric powers to the heaters 31-35 (corresponding to control signals to the electric power controllers 36-40 connected to the heaters 31-35), and *further to command electric powers to be fed to the heaters 31-35 so as to approximate estimated temperatures to target values.*"

That is, the heaters are controlled to cause both the estimated temperatures of the wafers W and the estimated temperatures of the thermocouples Sin1-Sin5 (the at least one predetermined portion in the processing container) to reach their target values (to coincide with the respective desired temperatures). Moreover, it is considered to be implicit in the step of controlling the heaters to cause the temperatures of the wafers W (the object to be processed) to coincide with the desired temperatures that the temperatures of the temperature sensors Sin1-Sin5 are also caused to coincide with the desired temperatures. Since the wafer temperatures are calculated using the temperatures of the temperature sensors Sin1-Sin5, when the wafers reach a desired temperature, the temperatures of the temperature sensors Sin1-Sin5 must have also necessarily reached a desired temperature. Thus, Wang et al. appears to anticipate Claim 1.

Moreover, even if it were considered that Wang et al. did not expressly or implicitly teach that the plurality of heaters are controlled so as to cause not only the forecasted temperatures of the objects to be processed but also the forecasted

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temperatures of the predetermined portions (the temperatures of the temperature sensors Sin1-Sin5) to respectively coincide with desired temperatures, it still would have been obvious to one of ordinary skill in the art, with a reasonable expectation of success, to complete the feedback control loop by configuring the controlling part to control the heaters such that the forecasted (estimated) temperatures of the predetermined portions would also respectively coincide with desired temperatures. It would have been obvious to one of ordinary skill in the art to make such a modification, if necessary, to the controlling part, in order to insure that the wafer temperatures (which are calculated from the temperatures of the temperature sensors Sin1-Sin5; Paragraph 57) have been caused to coincide with desired temperatures as desired by Wang et al. (Paragraph 49) One of ordinary skill in the art would recognize the desirable and predictable result of such a modification (if necessary) to exert complete feedback control over the temperatures of the wafers.

In regards to Claim 3, Wang et al. teaches that the at least one other predetermined portion in the processing container includes the temperature sensors Sin1 to Sin5, which are arranged on an inner pipe 2a of the processing container 2; i.e. an inside wall surface of the processing container 2. Therefore, the predetermined portion is considered to include a predetermined portion, i.e. the portions where the sensors are located, of an inside wall surface of the processing container.

In regards to Claim 8, Wang et al. teaches a unit 44 of introducing a gas to a gas introducing port of the processing container, and a unit 28 of discharging the gas from a gas discharging port 27 of the processing container 2, wherein the at least one other

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predetermined portion (i.e. the sensors Sin1-Sin5) is set between the gas introducing port and a portion on the most downstream side of the object W to be processed (i.e. a top portion of the chamber), along a path from the gas introducing port to the gas discharging port (wherein the gas flows through a gap between the inner pipe 2a and the outer pipe 2b to get to the gas discharging port 27). (Figure 2; at least Paragraph 42)

Claim Rejections - 35 USC § 103

6. Claim 2 and 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. in view of U.S. Patent Application Publication 2003/0019585 to Tometsuka.

The teachings of Wang et al. were discussed above in regards to Claim 1.

Wang et al. teaches a plurality of heaters 31-35, including an upper heater 31 and a lower heater 35 arranged correspondingly to an upper portion and a lower portion of the object to be processed (i.e. in upper and lower zones of treatment) contained in the processing container 2, as two of the plurality of heaters, and that corresponding temperature sensors Sin1 and Sin5 respectively are arranged between the object to be processed contained in the processing container and the corresponding heater. (Figure 2)

In regards to Claims 2 and 4-7, Wang et al. does not expressly teach that the heaters are arranged in the processing container and that the at least one other predetermined portion in the processing container includes the upper and lower heaters and at least an upper temperature sensor arranged between the object to be processed

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contained in the processing container and the upper heater. Wang et al. does not teach that the gas discharging pipe is connected to an upper portion of the processing container, wherein the upper heater is arranged so as to surround the gas discharging pipe.

Tometsuka teaches, in a thermal processing apparatus (Figure 3), a processing container 31 enclosing a reaction pipe 11, wherein a plurality of heaters 32a-32e are provided in the processing container 31 and include an upper heater 32a and a lower heater 32e, are arranged correspondingly to an upper and lower portion of an object to be processed (i.e. upper and lower zones of treatment), and wherein corresponding temperature sensors 34a-34e are arranged between the object to be processed contained in the processing container and the corresponding heater. (Figure 3; Paragraphs 27, 36, 37) Tometsuka teaches a gas discharging pipe 43 connected to an upper portion of the processing container (Paragraph 39), wherein the upper heater 32a is arranged so as to surround the gas discharging pipe, in that it is provided concentrically around a mouth of the gas discharging pipe, as broadly recited in the claims. Tometsuka teaches a feedback loop wherein the measured temperature of the temperature sensors 34a-34e is compared to a desired temperature of the heaters 32a-32e, and the heaters are controlled to cause the desired temperatures and the measured temperatures to coincide (Paragraph 37); i.e. the temperature sensors and the interior heaters of Tometsuka correspond to the at least one other predetermined portion in the processing container to be controlled as recited in the claims.

It would have been obvious to one of ordinary skill in the art to alternatively modify the teachings of Wang et al. as applied to Claim 1, with a reasonable expectation of success, to alternatively enclose the reaction pipe 2 of Wang et al. in a processing container and to include the heaters in the processing container, with corresponding temperature sensors provided between the heaters and the object to be processed, wherein the heaters and the temperature sensors correspond to the at least one other predetermined portion in the processing container for thermal control as recited in the claims, as suggested by the teachings of Tometsuka, as an art-recognized equivalent means of providing zoned heaters for a thermal processing apparatus. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). One of ordinary skill in the art would further have found it obvious to alternatively provide the heaters inside the processing container, with both the heaters and the temperature sensors corresponding to the other predetermined portion in the processing container (in addition to the object to be processed) for thermal feedback control, for the predictable result of confirming that the heaters are being energized to a desired temperature for a desired process, and to complete the feedback loop of control over all process variables.

It further would have been obvious to modify the teachings of Wang et al. as applied to Claim 1 to include a gas discharging pipe connected to an upper portion of the processing container, wherein the upper heater is arranged so as to surround a mouth of the gas discharging pipe, as suggested by the teachings of Tometsuka. The

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motivation for making such a modification (as well as an additional motivation for enclosing the reaction pipe inside the processing container), as taught by Tometsuka (see at least Paragraphs 39 and 55), would have been to create a space for the introduction of a chilling gas for rapidly lowering the temperature of the reaction pipe at the end of processing, and to provide an gas discharging pipe for exhausting the chilling gas. The positioning of the upper heater so as to surround a mouth of the gas discharging pipe would have been obvious to one of ordinary skill in the art as an art-recognized equivalent upper heater means. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). Moreover, Applicant has not presented any evidence of criticality that would tend to show the non-obviousness of freely selecting the positioning of the heaters as a matter of choice.

7. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. in view of U.S. Patent Application Publication 2003/0183614 to Yamaguchi et al.

The teachings of Wang et al. were discussed above in regards to Claim 1.

In regards to Claims 10 and 11, Wang et al. does not expressly teach a loading/unloading unit that loads and unloads the object to be processed to and from the processing container. Wang et al. does not teach that the thermal model is configured to forecast the temperature of the object to be processed and the temperature of the at least one other predetermined portion in the processing container

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during the loading and/or unloading process, wherein the controlling part is adapted to control the plurality of heaters so as to cause the forecasted temperature of the object to be processed and the temperature of the at least one other predetermined portion in the processing container to respectively coincide with desired temperatures defined by the recipe during the loading and/or unloading process.

Yamaguchi et al. teaches, in a thermal processing apparatus (Figure 1), a loading/unloading unit (boat elevator; not shown; Paragraph 34) that loads and unloads the object to be processed (wafers 1) to and from the processing container 21. (See at least Paragraphs 20 and 34; Figure 1) Yamaguchi et al. further teaches that the temperature of the object to be processed (wafers 1) and heaters 22a-22e and supplemental heater line 47 of sub-heater 45 should be controlled during a loading and unloading process to affect a standby temperature of a reaction pipe 11 and a temperature of the object to be processed during the loading and unloading. (See at least Paragraphs 34-37, 41, and 44-49)

It would have been obvious to one of ordinary skill in the art to modify the apparatus of Wang et al. to include a loading/unloading unit, as taught by Yamaguchi et al. The motivation for making such a modification, as taught by Yamaguchi et al. (see at least Paragraphs 34 and 46), would have been to enable a loaded wafer tower to be introduced to and removed from the reaction pipe.

It further would have been obvious to one of ordinary skill in the art, taking the teachings of Wang et al. and Yamaguchi et al. as a whole, to use the thermal model of Wang et al. to forecast the temperature of the object to be processed and the

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temperature of the at least one other predetermined portion in the processing container during the loading and/or unloading process as it forecasts said temperatures for a processing step, to modify the recipe to define desired temperatures of the object to be processed and the at least one other predetermined portion in the processing container during the loading and/or unloading process as it defines said desired temperatures for the processing step, and to use the controlling part to control the plurality of heaters so as to cause the forecasted temperature of the object to be processed and the temperature of the at least one other predetermined portion in the processing container to respectively coincide with desired temperatures defined by the recipe during the loading and/or unloading process, i.e. to exert feedback control as it exerts feedback control during the processing step. The motivation for making such a modification to the storing part and controlling part of Wang et al., as suggested by Yamaguchi et al. (see at least Paragraphs 36-38 and 44-48), would have been to control the maintenance of a standby state for the reaction pipe and a reduction to after a thermal processing to the standby state during an unloading process. Moreover, as the stack of wafers is lifted into or lowered from the reaction pipe, wafers higher in the stack receive more thermal processing. Control of the temperature of the object to be processed (the wafers) during a loading and/or unloading process can compensate for uneven amounts of thermal processing and reduce differences between the wafers. It would be obvious to extend the use of the feedback control taught by Wang et al. to accomplish these goals, as Wang et al. already teaches the suitability of the storing part comprising a thermal model and recipe and controlling part for ultimately causing the forecasted temperature

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of the object to be processed and the forecasted temperature of the predetermined portion to respectively coincide with the desired temperatures set forth in the recipe.

Double Patenting

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

9. Claim 1 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claim 14 of U.S. Patent No. 6,803,548 ('548).

Although the conflicting claims are not identical, they are not patentably distinct from each other because Claim 14 of '548 (which includes the limitations of Claims 8 and 13) teaches the claimed invention of instant Claim 1, including the plurality of heaters and plurality of temperature sensors; a storing part that stores: a thermal model for forecasting a temperature of the object to be processed contained in the container from outputs of the plurality of temperature sensors that includes a recipe in which a

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desired temperature (*target value*) of the object to be processed is defined, and a controlling part that forecasts a temperature of the object to be processed by using the outputs of the plurality of temperature sensors and the thermal model (*first-temperature-estimator*), and that controls the plurality of heaters (*controlling the heaters*) so as to cause the forecasted temperature of the object to coincide with the desired temperature defined in the recipe, wherein the thermal model is configured to additionally forecast a temperature of at least one other predetermined portion in the processing container (the temperature of the temperature sensors; *second-temperature estimator*), a desired temperature of the predetermined portion is also defined in the recipe, and the controlling part is adapted to forecast a temperature of the object and a temperature of the predetermined portion by using outputs of the plurality of temperature sensors and the thermal model, and to control the plurality of heaters so as to cause the forecasted temperature of the object to coincide with the respective desired temperature.

It is considered to be implicit in the step of controlling the heaters to cause the temperatures of the objects to be processed to coincide with the desired temperatures that the temperatures of the temperature sensors are also caused to coincide with the desired temperatures. Since the wafer temperatures are calculated using the temperatures of the temperature sensors by the first-temperature-estimator, when the objects reach a desired temperature, the temperatures of the temperature sensors must have also necessarily reached a desired temperature.

Moreover, even if it were considered that Claim 14 of '548 did not expressly or implicitly teach that the plurality of heaters are controlled so as to cause not only the

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forecasted temperatures of the objects to be processed but also the forecasted temperatures of the predetermined portions (the temperatures of the temperature sensors) to respectively coincide with desired temperatures, it still would have been obvious to one of ordinary skill in the art, with a reasonable expectation of success, to complete the feedback control loop by configuring the controlling part to control the heaters such that the forecasted (estimated) temperatures of the predetermined portions would also respectively coincide with desired temperatures. It would have been obvious to one of ordinary skill in the art to make such a modification, if necessary, to the controlling part, in order to insure that the wafer temperatures (which are calculated from the temperatures of the temperature sensors by the first-temperature-estimator) have been caused to coincide with desired temperatures. One of ordinary skill in the art would recognize the desirable and predictable result of such a modification (if necessary) to exert complete feedback control over the temperatures of the wafers.

10. Claims 2-7 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claim 14 of U.S. Patent No.

6,803,548 ('548) in view of Tometsuka.

The teachings of Claim 14 of '548 were discussed above in regards to Claim 1.

In regards to Claims 2-7, Wang et al. does not expressly teach that the heaters are arranged in the processing container and that the at least one other predetermined portion in the processing container includes the upper and lower heaters, a predetermined portion of an inside wall surface of the processing container, and at least

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an upper temperature sensor arranged between the object to be processed contained in the processing container and the upper heater. Wang et al. does not teach that the gas discharging pipe is connected to an upper portion of the processing container, wherein the upper heater is arranged so as to surround the gas discharging pipe.

Tometsuka teaches, in a thermal processing apparatus (Figure 3), a processing container 31 enclosing a reaction pipe 11, wherein a plurality of heaters 32a-32e are provided in the processing container 31 and include an upper heater 32a provided on an inside wall surface of the processing container and a lower heater 32e, are arranged correspondingly to an upper and lower portion of an object to be processed (i.e. upper and lower zones of treatment), and wherein corresponding temperature sensors 34a-34e are arranged between the object to be processed contained in the processing container and the corresponding heater. (Figure 3; Paragraphs 27, 36, 37) Tometsuka teaches a gas discharging pipe 43 connected to an upper portion of the processing container (Paragraph 39), wherein the upper heater 32a is arranged so as to surround the gas discharging pipe, in that it is provided concentrically around a mouth of the gas discharging pipe, as broadly recited in the claims. Tometsuka teaches a feedback loop wherein the measured temperature of the temperature sensors 34a-34e is compared to a desired temperature of the heaters 32a-32e, and the heaters are controlled to cause the desired temperatures and the measured temperatures to coincide (Paragraph 37); i.e. the temperature sensors and the interior heaters, as well as the portion of the inside wall surface on which upper heater 32a is provided (since it is in thermal contact with and forms the environment for the heater) of Tometsuka correspond to the at least one

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other predetermined portion in the processing container to be controlled as recited in the claims.

It would have been obvious to one of ordinary skill in the art to alternatively modify the teachings of Claim 14 of '548 as applied to Claim 1, with a reasonable expectation of success, to include the heaters in the processing container, with corresponding temperature sensors provided between the heaters and the object to be processed, and at least one heater being provided on the inside wall surface of the processing container, wherein the heaters, the temperature sensors, and a predetermined portion of an inside wall surface of the processing container on which a heater is provided correspond to the at least one other predetermined portion in the processing container for thermal control as recited in the claims, as suggested by the teachings of Tometsuka, as an art-recognized equivalent means of providing zoned heaters for a thermal processing apparatus. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). One of ordinary skill in the art would further have found it obvious to alternatively provide the heaters inside the processing container, with both the heaters and the temperature sensors corresponding to the other predetermined portion in the processing container (in addition to the object to be processed) for thermal feedback control, for the predictable result of confirming that the heaters are being energized to a desired temperature for a desired process, and to complete the feedback loop of control over all process variables.

It further would have been obvious to modify the teachings of Claim 14 of '548 as applied to Claim 1 to include a gas discharging pipe connected to an upper portion of the processing container, wherein the upper heater is arranged so as to surround a mouth of the gas discharging pipe, as suggested by the teachings of Tometsuka. The motivation for making such a modification, as taught by Tometsuka (see at least Paragraphs 39 and 55), would have been to create a space for the introduction of a chilling gas for rapidly lowering the temperature of the reaction pipe at the end of processing, and to provide an gas discharging pipe for exhausting the chilling gas. The positioning of the upper heater so as to surround a mouth of the gas discharging pipe would have been obvious to one of ordinary skill in the art as an art-recognized equivalent upper heater means. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). Moreover, Applicant has not presented any evidence of criticality that would tend to show the non-obviousness of freely selecting the positioning of the heaters as a matter of choice.

11. Claim 8 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claim 14 of U.S. Patent No. 6,803,548 ('548) in view of U.S. Patent Application Publication 2002/0045146 to Wang et al.

The teachings of Claim 14 of '548 were discussed above in regards to Claim 1.

In regards to Claim 8, Claim 14 of '548 does not expressly teach the claimed unit of introducing a gas and unit of discharging a gas.

Wang et al. teaches a unit 44 of introducing a gas to a gas introducing port of the processing container, and a unit 28 of discharging the gas from a gas discharging port 27 of the processing container 2, wherein the at least one other predetermined portion (i.e. the sensors Sin1-Sin5) is set between the gas introducing port and a portion on the most downstream side of the object W to be processed (i.e. a top portion of the chamber), along a path from the gas introducing port to the gas discharging port (wherein the gas flows through a gap between the inner pipe 2a and the outer pipe 2b to get to the gas discharging port 27). (Figure 2; at least Paragraph 42)

It would have been obvious to one of ordinary skill in the art to modify the apparatus taught by Claim 14 of '548 to include the claimed unit of introducing a gas and unit of discharging a gas, wherein the at least one other predetermined portion in the processing container is set between the gas introducing port and a portion on the most downstream side of the object to be processed (i.e. a top portion of the chamber), along a path from the gas introducing port to the gas discharging port, as taught by Wang et al. The motivation for making such a modification, as taught by Wang et al. (Paragraph 42), would have been to employ a suitable means to introduce and exhaust the processing gas for treating the objects to be processed.

12. Claims 10 and 11 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claim 14 of U.S. Patent No. 6,803,548 ('548) in view of Tometsuka.

The teachings of Claim 14 of '548 were discussed above in regards to Claim 1.

In regards to Claims 10 and 11, Claim 14 of '548 does not expressly teach a loading/unloading unit that loads and unloads the object to be processed to and from the processing container. Claim 14 of '548 does not teach that the thermal model is configured to forecast the temperature of the object to be processed and the temperature of the at least one other predetermined portion in the processing container during the loading and/or unloading process, wherein the controlling part is adapted to control the plurality of heaters so as to cause the forecasted temperature of the object to be processed and the temperature of the at least one other predetermined portion in the processing container to respectively coincide with desired temperatures defined by the recipe during the loading and/or unloading process.

Yamaguchi et al. teaches, in a thermal processing apparatus (Figure 1), a loading/unloading unit (boat elevator; not shown; Paragraph 34) that loads and unloads the object to be processed (wafers 1) to and from the processing container 21. (See at least Paragraphs 20 and 34; Figure 1) Yamaguchi et al. further teaches that the temperature of the object to be processed (wafers 1) and heaters 22a-22e and supplemental heater line 47 of sub-heater 45 should be controlled during a loading and unloading process to affect a standby temperature of a reaction pipe 11 and a temperature of the object to be processed during the loading and unloading. (See at least Paragraphs 34-37, 41, and 44-49)

It would have been obvious to one of ordinary skill in the art to modify the apparatus of Claim 14 of '548 to include a loading/unloading unit, as taught by Yamaguchi et al. The motivation for making such a modification, as taught by

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Yamaguchi et al. (see at least Paragraphs 34 and 46), would have been to enable a loaded wafer tower to be introduced to and removed from the reaction pipe.

It further would have been obvious to one of ordinary skill in the art, taking the teachings of Claim 14 of '548 and Yamaguchi et al. as a whole, to use the thermal model of Claim 14 of '548 to forecast the temperature of the object to be processed and the temperature of the at least one other predetermined portion in the processing container during the loading and/or unloading process as it forecasts said temperatures for a processing step, to modify the recipe to define desired temperatures of the object to be processed and the at least one other predetermined portion in the processing container during the loading and/or unloading process as it defines said desired temperatures for the processing step, and to use the controlling part to control the plurality of heaters so as to cause the forecasted temperature of the object to be processed and the temperature of the at least one other predetermined portion in the processing container to respectively coincide with desired temperatures defined by the recipe during the loading and/or unloading process, i.e. to exert feedback control as it exerts feedback control during the processing step. The motivation for making such a modification to the storing part and controlling part of Claim 14 of '548, as suggested by Yamaguchi et al. (see at least Paragraphs 36-38 and 44-48), would have been to control the maintenance of a standby state for the reaction pipe and a reduction to after a thermal processing to the standby state during an unloading process. Moreover, as the stack of wafers is lifted into or lowered from the reaction pipe, wafers higher in the stack receive more thermal processing. Control of the temperature of the object to be

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processed (the wafers) during a loading and/or unloading process can compensate for uneven amounts of thermal processing and reduce differences between the wafers. It would be obvious to extend the use of the feedback control taught by Claim 14 of '548 to accomplish these goals, as Claim 14 of '548 already teaches the suitability of the storing part comprising a thermal model and recipe and controlling part for ultimately causing the forecasted temperature of the object to be processed and the forecasted temperature of the predetermined portion to respectively coincide with the desired temperatures set forth in the recipe.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maureen Gramaglia whose telephone number is (571)272-1219. The examiner can normally be reached on core hours of 10-5, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Maureen Gramaglia/
Examiner, Art Unit 1792